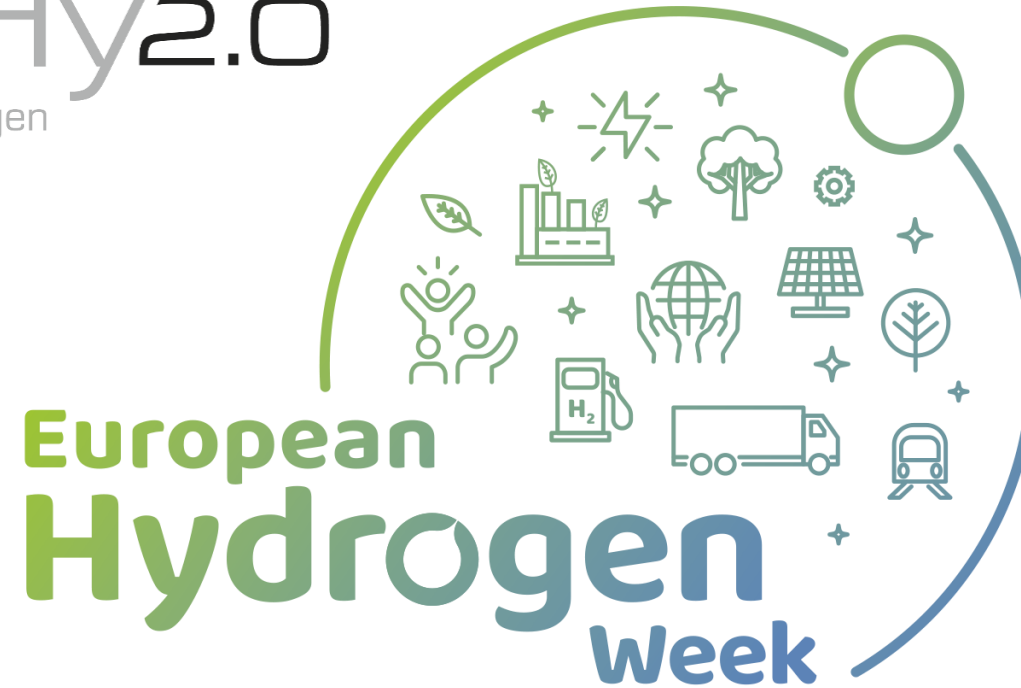


Green Industrial Hydrogen via steam electrolysis



Simon Kroop

Salzgitter Mannesmann Forschung GmbH

www.green-industrial-hydrogen.com

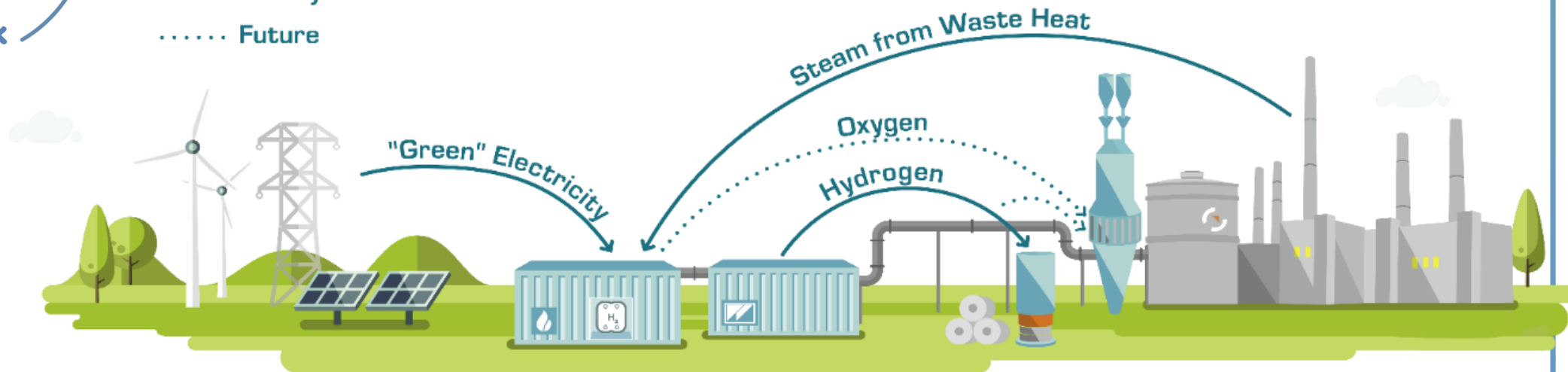
s.kroop@sz.szmf.de

#PRD2021
#CleanHydrogen



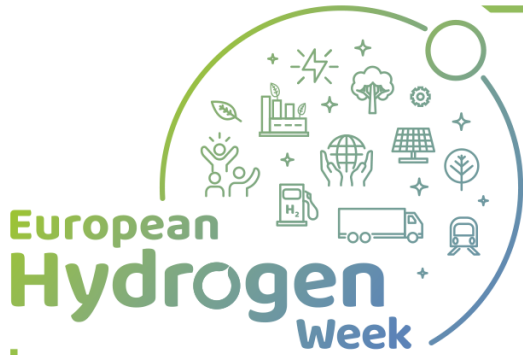
Project Mission

—— GrInHy2.0
..... Future



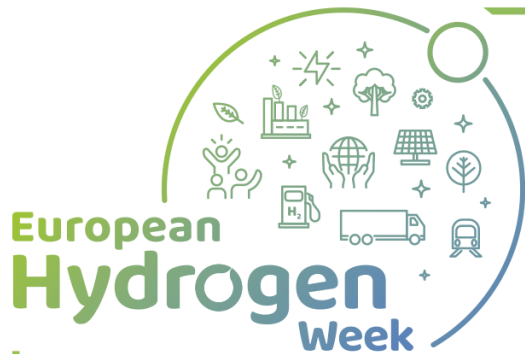
GrInHy2.0 is...

- operating the **world's first** High-Temperature Electrolyser of the **Megawatt-class**.
- most energy-efficient hydrogen production using **green electricity** and **steam from waste heat**.
- the **full integration** into the existing infrastructure of **Salzgitter's steel production**.
- setting new standards in **long-term stack validation** of the Solid Oxide Electrolysis Cell technology.



Project Overview

- Call year: 2018
- Call topic: FCH-02-2-2018 - Demonstration of large-scale steam electrolyser system in industrial market
- Project dates: 01/2019 - 12/2022
- % stage of implementation 01/12/2021: 72.9 %
- Total project budget: >6 million €
- FCH JU max. contribution: 4 million €
- Other financial contribution: none
- Partners: Salzgitter AG, Sunfire GmbH, Paul Wurth S.A., Tenova SpA, CEA

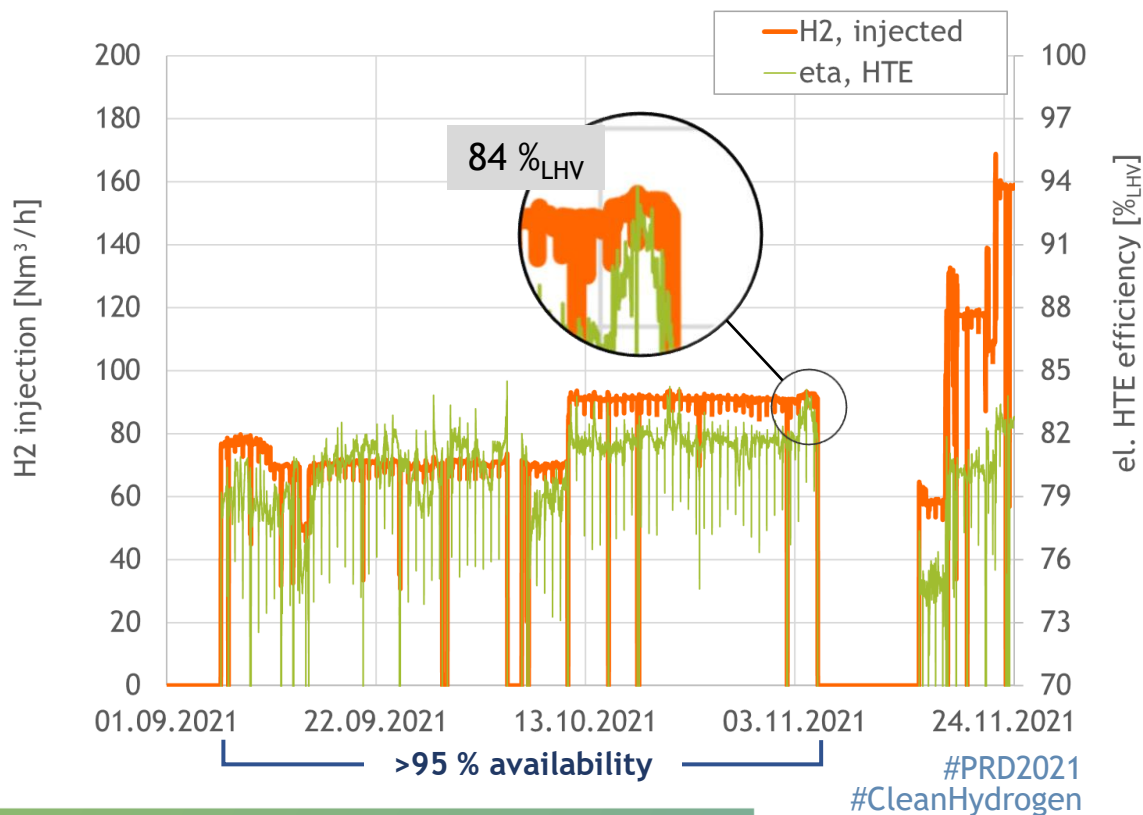


Who is GrInHy2.0?



Project Progress - Efficiency and Availability

Achievement to-date **39.7 kWh/kg** <40 kWh/kg



	25%	50%	75%
		GrInHy2.0	FCH2JU 2020
Electricity consumption¹⁾		39.7 kWh/kg 84 %_{LHV}	40 kWh/kg 83.3 % _{LHV}
Availability²⁾		80 % ca. 1,500 h	95 %

- 1) 1 kg hydrogen, saturated at atmospheric pressure
- 2) System operational and injects hydrogen, since 05/2021

Project Progress - Green Hydrogen Production



Achievement to-date

32.1 t_{H2}



100 t_{H2}

25%

50%

75%



**SALZGITTER
FLACHSTAHL**
A Member of the Salzgitter Group

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#CleanHydrogen

24/11/2021

GrInHy2.0

**Green hydrogen
production**

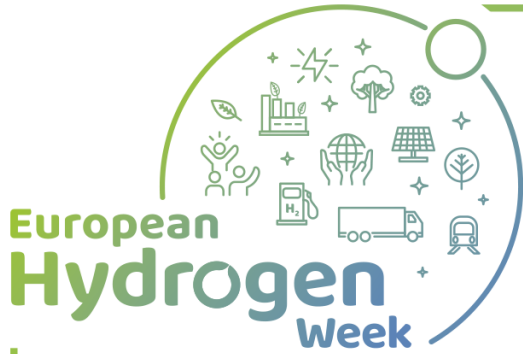
32.1 t_{H2}

100 t_{H2}

**Operating hours
(H₂ production + injection)**

4,900 h

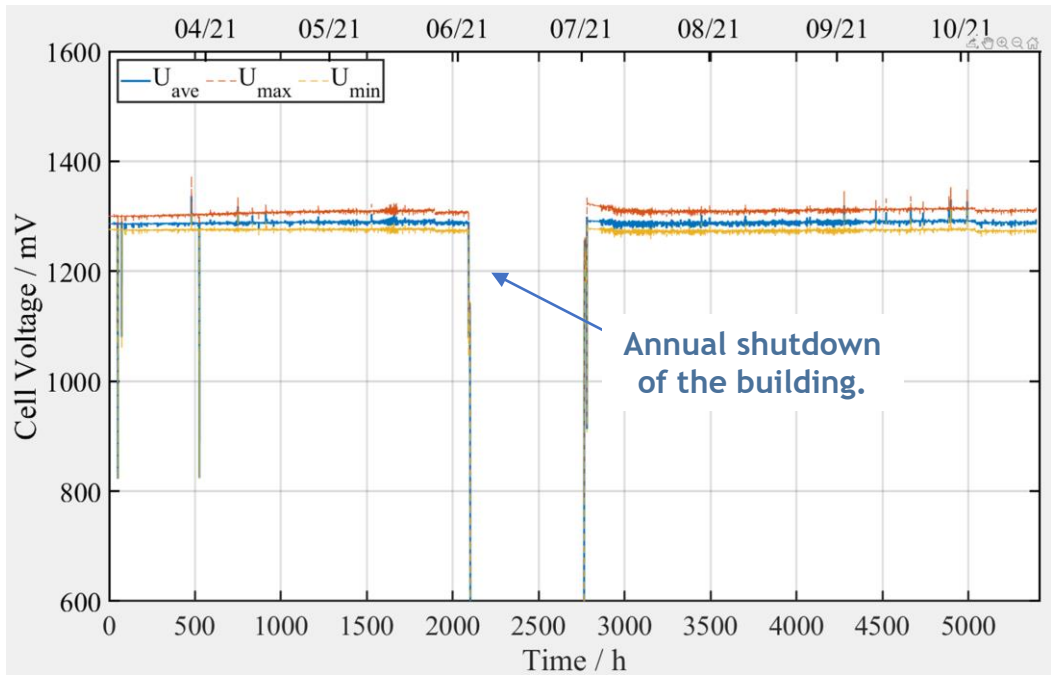
13,000 h



Project Progress - Stack Testing



25% 50% 75%



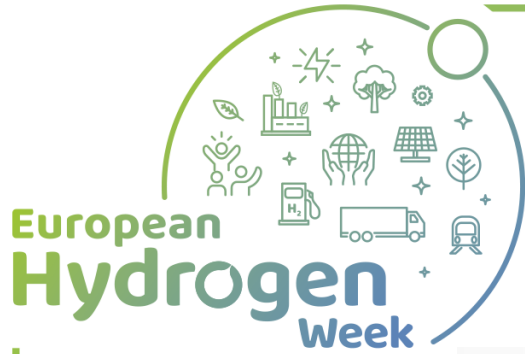
	GrInHy2.0	FCH2JU 2020
Production loss rate	0.47%/1kh	1.9 %/1kh

Stack #1: 06/2020 - 12/2020

- Destroyed at 4,500 h because of a building-wide gas supply cut-off due to lvl.2 H2 detection

Stack #2: 03/2021 - today

- Current stack is performing well after about 5,000 h
- ca. 13,000 h at project end
- Degradation rate: 15 mOhm.cm².kh⁻¹

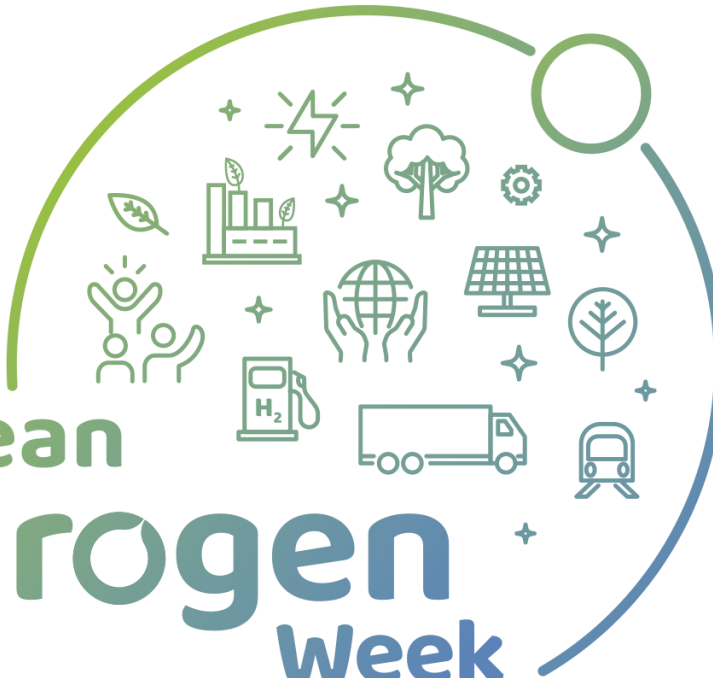


Communications Activities



BART BIEBUYCK

EXECUTIVE DIRECTOR FCH JU



**European
Hydrogen
Week**

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